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TiDE Model – Creating Plurilingual Digital Materials with Future Preschool Teachers

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Abstract/Izvleček

This article deals with developing plurilingual digital content with future preschool teachers. We present the TiDE (Teaching in Digital Education) model which promotes the development of digital didactic materials and relevant digital competences through active, experience-based, and interdisciplinary learning. A qualitative study was conducted focused on the process of designing new digital didactic materials for raising plurilingual awareness, i.e. stop-motion videos for preschool children. The data were obtained by analysing 16 stop-motion videos and feedback from 60 Slovenian first-year students of preschool education at the University of Primorska. The results suggest that new digital technologies can be very effective in developing engaging, effective, and learner-centered resources that promote students' plurilingual awareness and an open attitude towards linguistic and cultural diversity.

Model TiDE - Ustvarjanje digitalnega gradiva za raznojezično izobraževanje z bodočimi vzgojitelji

Prispevek obravnava pomen raznojezičnega izobraževanja in didaktične rabe digitalnih tehnologij v predšolskem obdobju. Predstavljamo model TiDE (Teaching in Digital Education), ki spodbuja razvoj digitalnih didaktičnih gradiv in ustreznih digitalnih kompetenc skozi načela aktivnega, izkustvenega in interdisciplinarnega učenja. Izvedena je bila kvalitativna študija, s katero smo raziskali proces ustvarjanja digitalnih didaktičnih gradiv (video posnetkov stop-motion) za razvijanje raznojezičnosti predšolskih otrok po modelu TiDE. Podatki so bili pridobljeni z analizo 16 stop-motion videov in povratnih informacij 60 slovenskih študentov prvega letnika predšolske vzgoje na Univerzi na Primorskem. Rezultati kažejo, da so lahko nove digitalne tehnologije zelo učinkovite pri razvoju zanimivih, učinkovitih in na učence osredotočenih virov, ki spodbujajo večjezično ozaveščenost učencev ter odprt odnos do jezikovne in kulturne raznolikosti.

Keywords:
stop-motion video, plurilingual education, future preschool teachers, digital technologies, TiDE model.

Ključne besede: video posnetki stop-motion, večjezično izobraževanje, bodoči predšolski učitelji, digitalne tehnologije, model TiDE.

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Introduction

Nowadays, multilingual learning environments are becoming increasingly common in Europe due to the rapid increase in global mobility and migration. For this reason, one of the main concerns of the European Centre of Modern Languages (ECML) and the Council of Europe is the preservation of linguistic diversity and the promotion and use of plurilingual education in multilingual environments to promote and support access to quality education for all (Newby et. al, 2007). Plurilingual education promotes linguistic, racial, social, and cultural inclusion. When learners feel this sense of inclusion, they can take control of their learning journey and make positive changes in their educational pathway (Payant & Galante, 2022).

At this point, it is important to distinguish between the terms 'multilingualism' and 'plurilingualism', which are often used interchangeably to refer to teaching that involves learners in the use of their language repertoire. According to the Council of Europe definitions (2007, p. 9), 'multilingualism' refers to the presence of more than one 'language variety' in a geographical area, while 'plurilingualism' refers to the repertoire of language varieties used by many individuals, i.e. the 'mother tongue' or 'first language' and any number of other languages or varieties. This means that in some multilingual areas, some people may be monolingual and others plurilingual. However, due to the limited and insufficient understanding of plurilingualism and the lack of resources that facilitate the integration of home languages in the classroom (Van Gelder & Visser, 2005), children from linguistically diverse backgrounds are exposed to school languages, ideologies, and strategies that do not match their language practises at home (Spotti & Kroon, 2017). Many teachers still favour monolingual forms of teaching, even though research has shown that including students' home languages in the classroom has positive effects on their cognitive development, identity formation, general well-being, and sense of belonging at school (Kirsch & Duarte, 2020).

This underlines the need for comprehensive initial teacher training programmes that prioritise plurilingualism, as well as continuous professional development opportunities for teachers in this area. Such programmes should focus on promoting language awareness and equipping educators with strategies to effectively support and recognise linguistic diversity in the classroom (Smeins et al., 2022). Van Laere et al. (2017) suggest that technology could be a solution.

Research has shown that the use of technology that supports learners' home languages can enhance the learning process (e.g. Clark et al., 2012; Lu et al., 2014)

without requiring teachers to speak all of their learners' home languages (Van Laere et al., 2017). Nevertheless, digital technologies should be appropriately integrated into classroom practises and play activities by using technology as a tool to enhance the learning process (OECD, 2017). For this reason, digital pedagogy begins with defining the purpose and goals of teaching and learning (Väätäjä & Ruokamo, 2021). However, digital teaching is used more effectively when teachers know and understand the technology and can recognise how digital tools and resources can be used to achieve better learning outcomes. These competences are crucial for achieving positive outcomes for learners with additional support needs or other disadvantages (The Scottish Government, 2015).

The study presented in this article is related to the GDI UP (Green Digital & Inclusive University of Primorska) project, in particular to the activity Green and digital transition competences in the early childhood education curriculum. One of the main objectives of the activity is related to a programme for digital transition in early childhood education, focusing on an interdisciplinary approach through the integration of digital technologies. Simultaneously, the transformation and creation of information and digital content is also one of the key competence areas proposed by the OECD (2019, p. 46) and DigComp 2.2 − The Digital Competence Framework for Citizens (Vuorikari et al., 2022). In vein with the above, we developed the TiDE (Teaching in Digital Education) model which promotes the development of digital teaching content and fosters relevant digital competences through active, experiential, and interdisciplinary learning. The main objectives of our qualitative study were to develop digital didactic materials (stop-motion videos) that would promote plurilingualism and technology awareness among future preschool teachers and consequently preschool children and to evaluate the TiDE model.

Our research begins with a review of the relevant literature on plurilingual education and digital technologies in the broadest sense, with a particular focus on the use of stop-motion videos for educational purposes and the design of digital didactic materials. Next, we present the steps within the TiDE model, aiming to promote the development of digital teaching content and relevant digital competences through active, experiential, and interdisciplinary learning at the university level. In the second part of the paper, we present the results of aqualitative study conducted among 60 Slovenian students of the first year of preschool education whose task was to evaluate the TiDE model.

Pluricultural and plurilingual education

The terms pluricultural and plurilingual education refer to school and classroom activities aimed at teaching students about cultural and linguistic diversity, particularly the diversity present within their communities (Marconi et al., 2020). The inclusive approach encompasses not only the languages taught in school but also all languages the learner encounters, such as home languages, dialects, sign languages, religions, and lifestyle, as highlighted in the Framework of Reference for Pluralistic Approaches to Languages and Cultures (FREPA), which offers descriptors for plurilingual and intercultural competence (Bratož & Sila, 2021; Marconi et al., 2020). Galante et al. (2022, p. 13-17) present five strategies that foster successful integration of students' language repertoires into pedagogical contexts:

- cross-linguistic comparisons: Comparing students' native language with the target language at different levels, including linguistic features such as grammar, syntax, phonology and morphology, and language use. Through cross-linguistic comparisons, students actively participate in the learning process and feel that their language repertoire is respected and valued in the classroom.
- cross-cultural comparisons: They gain an insight into diverse cultures, including their customs, values, beliefs, and language use. Through cross-cultural comparisons, students can cultivate critical thinking, understand how knowledge is created, and appreciate diverse cultural perspectives.
- translanguaging: The practice of using different languages fluently is an effective approach to understanding content in a new language. Using languages other than the first language facilitates continuous communication and increases the effectiveness of language learning by ensuring understanding of the content and making language learning more relevant.
- translation for mediation: Incorporating translation exercises when introducing new expressions, vocabulary, or grammatical elements into the classroom. This way, students can compare the meanings in different languages, assess whether there are direct translations, and analyse differences in pronunciation. Through translation exercises in different languages, students get multiple opportunities to explore the meanings of words, which leads to more effective learning.
- pluriliteracies: In addition to traditional forms of communication such as listening, speaking, reading, and writing, students use additional forms of literacy such as visual representations, photos, gestures, and digital media.

When future preschool teachers engage in plurilingual and pluricultural education, they gain first-hand experience crucial for implementing such teaching and learning with preschool children through age-appropriate activities. These activities include songs and stories, role-playing games, interactive apps and digital tools, and board games, which focus on sharing simple words and phrases from various languages. This experience helps future teachers understand how to respect and value children's language repertoires, appreciate diverse cultural perspectives, enhance content understanding, deepen word exploration, and utilize various forms of literacy, ultimately enriching their teaching methods.

The importance of digital technologies in early childhood education

The main goal of using digital technologies in early childhood education is to provide meaningful learning experiences that empower young learners to actively build or extend their knowledge (Giannikas, 2020), thus promoting the development of 21st-century skills such as collaboration, communication, critical thinking, and problem-solving (Kewalramani et al., 2020; Lemut Bajec, 2023). Within the constructivist paradigm, which builds on learner-centredness, learner-initiated learning, and learner-directed experiences, the digital context in which learning takes place is seen as essential to the learning process, and recognising this importance can be central to teaching and creating educational programmes that use digital pedagogy (Giannikas, 2020). Digital technologies include devices such as tablets, mobile phones, laptops, and computers, as well as screenless technologies like digital cameras, voice assistants, digital toys, smart toys, walkie-talkies, and activity trackers (Wilkinson, et al., 2021). In early education, children are receptive to digital tools that present content in engaging and motivating ways, rewarding their efforts and achievements, for example through digital badges (Giannikas, 2020). According to Copple and Bredekamp (2009), incorporating appropriate digital technologies into young children's daily routines can enhance their engagement with materials, activities, and interactions.

Since children are already familiar with digital and non-digital tools at home and in their surroundings, integrating technology into their learning environment is logical. However, it is crucial to ensure that technology complements, rather than replaces, other materials, creativity, play, and interactive activities to optimize the development of cognitive, social-emotional, and language skills.

In language learning, children become more actively involved in listening and using digital tools, which encourage them to engage with and interpret auditory and visual cues to understand the message conveyed by speakers. Integrating spoken language with gestures and facial expressions enhances comprehension by linking language to real-world concepts and references stored in memory (Rost, 2002, p. 59). Digital resources such as videos, songs, stories, and interactive simulations providing young learners with access to authentic language material familiarise them with the target language in practical contexts, contributing to the develop–ment of listening comprehension, vocabulary, and cultural awareness.

Young learners can engage in interactive activities, group projects, and online discussions with peers from different countries, allowing them to learn and communicate together. This collaboration improves their social and communi–cation skills in the target language and fosters a sense of global connectedness. Digital tools allow young learners to express their creativity and create their own digital stories or projects (Bers et al., 2004; Freeman & Somerindyke, 2001; Shahrimin & Butterworth, 2001).

The most useful technologies for working with children are tablets and projectors. However, to ensure effective learning, teachers must do more than just bring computers into the classroom. They must have the knowledge and skills to use technology effectively, understand the underlying learning theories, and select the appropriate technology to achieve the desired learning outcomes.

According to Lindeman, Svensson, and Enochsson (2021), teachers integrate digital technologies to varying degrees due to factors such as digital competence, various pedagogical aspects, personal drive as well as professional learning and development. However, teachers need to enhance their own digital skills to meet the expectations of students and parents who anticipate learning and teaching through digital means (Howell & McMaster, 2022).

Stop-motion videos in educational settings

Even though there are emergent studies on the use of digital technologies in educational settings, there is scarce literature on the use of stop-motion videos for raising plurilingual awareness. Stop-motion video is a method involving the physical movement of objects, captured frame by frame to create the illusion of motion. This technique allows for the addition of narration, music, and visual or auditory effects during editing. By engaging in the creation of a stop-motion video, learners are

prompted to re-evaluate and develop their ideas across various modes, as highlighted by Berg et al. (2019) and Hoban and Nielsen (2010).

Incorporating stop-motion videos into classroom settings brings numerous advantages. They can be customised to students' interests, making the material more engaging and relevant (Sanjaya, 2020). Compared to static images, stop-motion videos capture students' attention better and make learning easier, more efficient, and more enjoyable (Berney & Bétrancourt, 2016; Jitsupa et al., 2022). These videos help to stimulate interest, improve comprehension, and increase vocabulary (Sanjaya, 2020). They also enable teachers to keep students interested over a longer period and encourage unconscious learning through innovative methods (Jitsupa et al., 2022).

Stop-motion videos are suitable for presentations and for all age groups (Farrokhnia et al., 2020). They contain sounds that create a dynamic and engaging learning experience where learning is fun and exciting rather than challenging (Sanjaya, 2020). Hoban and Nielsen (2012) explored stop-motion animation as a tool for developing early literacy skills in preschool settings, revealing that creating stop-motion videos supported children's language development, storytelling abilities, and narrative skills. The multimodal nature of stop-motion animation provided opportunities for children to express themselves creatively and engage in meaningful communication. Kapaniaris and Lagogianni (2020) used stop-motion video to present traditional clothing in Primary Education with 10- to 11-year-old children. Although the results showed that students have limited knowledge of folk culture and traditional clothing, students were able to comprehend the specific issue through digital storytelling and create their own digital stories, acquiring knowledge in both folk culture and computer literacy through guided research projects. Additionally, students showed significant growth in collaborative learning environments, demonstrating critical thinking and imagination.

Model description

The TiDE (Teaching in Digital Education) model has emerged as a result of the piloting of several of our activities designed for developing the technological as well as plurilingual and pluricultural competence of future preschool teachers. The phases of the TiDE model are inspired by Sanjaya's (2020) procedure for creating engaging stop-motion videos to teach theme-based vocabulary to elementary students. However, unlike Sanjaya's model, our model emphasises an active, experience-based (exploratory), and interdisciplinary learning process, because as pointed out by

Ivanitskaya et al. (2002), learners who are capable of true interdisciplinary thinking, possess well-developed knowledge structures, foundational epistemological beliefs, critical thinking, and metacognitive skills, as well as the ability to apply interdisciplinary knowledge to various relevant contexts.

The phases are outlined as follows (Figure 2):

1. Teachers identify *the purpose* of using new digital technologies by determining which digital tool to use and for what specific purpose within a particular curriculum area. For example, they might decide to use stop-motion videos to enhance plurilingualism/storytelling skills or educational apps to help students visualise and solve geometry problems, while in social studies, they could use virtual reality to provide immersive historical experiences.
2. The model emphasises *interdisciplinary learning*. This means that teachers *determine the learning objectives for each curriculum area*, including the obligatory area of technology and the chosen area of language. For example, in the technology area, students will be able to design and produce engaging digital content using multimedia tools, demonstrating proficiency in both technical skills and creative expression. In the language area, students will develop the ability to create and utilize educational resources that support plurilingualism, enhancing their understanding of multiple languages and cultures while fostering inclusive communication in diverse classroom settings.
3. Educators define *how students' competences will be developed in each area*. In the digital area, they teach students how to use and design new material for educational purposes, following predetermined criteria. This includes integrating technical and audiovisual elements to represent instructional content and creating lesson plans, handouts, and other supporting materials. Special emphasis is placed on developing both digital and visual literacy, which are key competences in multiliteracy pedagogy. In the language area, educators focus on teaching students how to create and utilize plurilingual educational resources. This involves developing materials that support multiple languages, thereby enhancing students' understanding of diverse cultures and fostering inclusive communication in varied classroom settings.
4. Product development begins with *exploratory learning*. In the technology area, students work in groups or pairs to explore the app's functionality and form opinions on its use. They then present and discuss their newly created digital didactic materials with the ICT teacher, addressing their purpose and any technological challenges they encountered.

5. They create *a preliminary product for educational purposes* on a specific topic preferably chosen by the students. When creating digital didactic materials for language learners, researchers provide several key recommendations. Hoban and Nielsen (2012) advocate for incorporating multiple modes of representation, including visuals, audio, and text to enhance comprehension and language acquisition. Bitchener (2018) stresses the importance of aligning digital materials with the developmental level and interests of young learners, ensuring age-appropriate, culturally relevant, and engaging content. Moreover, Kewalramani et al. (2020) highlight the necessity of designing user-friendly, inclusive, and accessible materials, focusing on layout, navigation, and functionality to accommodate young learners effectively. Additionally, Donaghy and Xerri (2017) emphasize the significance of images in foreign language learning, questioning whether they are supplemental tools or integral components for effective communication. They underscore the potential of images to enhance students' communicative skills and foster creativity in the language learning process. Integrating these recommendations can significantly contribute to the development of effective digital materials for preschool children. Students present their preliminary product to their classmates and teachers.

6. Teachers and students offer valuable and supportive *feedback* on the integration and use of technical and audiovisual elements, as well as the didactic purpose of created digital materials. For gathering feedback, the following questions, based on the recommendations above, can help evaluate the digital materials for language learning:

- How effectively do digital didactic materials incorporate visuals, audio, and text, thus supporting comprehension and language acquisition?
- How effectively do the images enhance communicative skills and foster creativity?
- Do the audio elements include clear and age-appropriate narration and/or sound effects that enhance the learning experience?
- Are the digital didactic materials aligned with the developmental level of the target age group?
- Are the educational materials designed to align with the interests of students in order to keep them engaged and motivated?
- Are the content and themes culturally relevant and appropriate for the intended audience?
- How user-friendly and age-appropriate are the materials in terms of layout, navigation, and overall functionality?

- Are the digital didactic materials inclusive and accessible in creation and use?

By addressing these questions, students can comprehensively assess the quality and effectiveness of digital didactic materials (*a preliminary product*) designed for preschool children, ensuring they meet educational standards and support optimal language development.

7. Final product: The final product can be used for educational purposes in kindergarten.

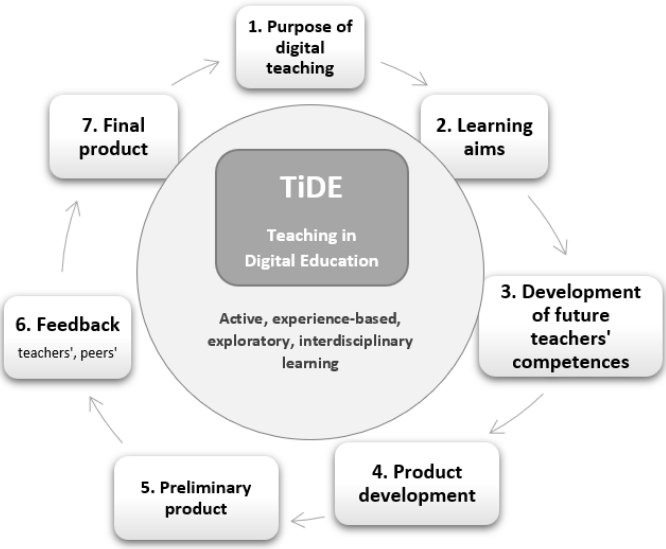

Figure 1: The phases of the TiDE (Teaching in Digital Education) model

Methodology

To evaluate the TiDE model, we carried out a qualitative evaluation study based on experience-based, exploratory, and interdisciplinary learning in which we observed students developing plurilingual digital didactic materials for preschool children. The aims of the survey were twofold: first, we aimed to develop digital didactic materials (stop-motion videos) to promote plurilingualism and technology awareness among future preschool teachers and preschool children and second, we attempted to understand the benefits of using the TiDE model at the university level for future preschool teachers?

To this end, the following research questions were formulated:

Q1. What were the most significant challenges encountered in creating plurilingual digital didactic materials?
Q2. What benefits does the TiDE model offer to university-level training for preschool teachers in enhancing teaching practices and outcomes?

Participants and data collection

The study involved 62 participants, consisting of 2 professors and 60 Slovenian first-year students of preschool education at the University of Primorska. The activities were conducted over three weeks. First-year preschool education students were divided into 16 smaller groups. Each group created digital didactic materials (stop-motion videos) to promote plurilingualism and technology awareness among future preschool teachers and children.

For the evaluation, we used different methods: a) a questionnaire for teachers' and classmates' feedback on the preliminary and final product with various open-ended questions to gain a comprehensive understanding of their experiences and perspectives; b) a final questionnaire on the process of creating plurilingual digital didactic materials for preschool children; and c) the analysis of the final product by 2 professors (one for English as a foreign language and one for ICT). As Swart (2019) emphasises, the use of an open questionnaire with open-ended questions as an instrument for collecting qualitative data during observation is a suitable method for collecting qualitative data.

Feedback and video analysis were conducted based on the questions outlined in the model description (phase 6). The students' responses to the final questionnaire were recorded and are now presented in this article.

The students were presented with the following open-ended questions: *How effectively do digital didactic materials incorporate visuals, audio, and text to support comprehension and language acquisition, What were some of the biggest challenges in creating new digital didactic materials, What areas for improvement were suggested by peers and teachers? and Where do students see potential applications of the stop-motion videos in other curriculum areas?*

The phases of the research regarding the TiDe model

To understand the development and application of the TiDe model, the following phases were undertaken:

1. The *purpose* of developing plurilingual awareness with stop-motion videos: due to the lack of resources that facilitate the integration of home languages in preschool groups, these digital didactic materials are becoming increasingly

important to meet the diverse learning and teaching needs, especially in institutions with a high number of children and multilingualism.

2. The *learning aims*. The aims in the area of language were to develop students' plurilingual awareness and multiliteracy skills through the creation of stop-motion videos; in the area of technology, the aims were to develop relevant digital competences and create digital didactic materials by utilizing the principles of active, experiential and interdisciplinary learning.
3. *The development of the competences of future preschool teachers:* Future preschool teachers first explored the stop-motion app and created stop-motion videos with their objectives. In this way, they took responsibility for their learning process. They formed their own opinions about the functionality of the app and conducted their tests and explorations to understand how it works. In the English course, they learnt about the importance of raising plurilingual awareness in a multilingual and multicultural educational environment and about strategies that can be used to integrate students' language repertoire in educational contexts. Additionally, they also learnt about the role of visual literacy in the creation of digital didactic media.
4. *Product development:* Initially, the students were provided with plurilingual songs in English (audio files), which also included words in target languages such as Slovenian, Croatian, German, Italian, and French. The song for each country associated listeners/viewers with its cultural elements (sports with Slovenia, sea animals with Croatia, polka dance with Austria, pizza with Italy, and clothes with France). Then, they were tasked with a stop-motion video where they needed to incorporate visual elements. including the preparation of the background, characters, storyboard, and timeline for movements, as well as technical elements (fixed camera, lighting). They were requested to use only original work (e.g. drawings, puppets). Along the creation of the stop-motion video, the students were reminded to keep in mind that the product needed to be used for teaching purposes.
5. and 6. *The preliminary products and constructive feedback*:
   After creating a simple stop-motion animation video classmates and teachers provided feedback on the integration and use of technical and audiovisual elements and the didactic presentation of content. This was an important phase as students learned from each other's work. Teachers' role was also to facilitate discussions to deepen understanding and encourage reflection on the learning experience.

7. Revision and the final version:

Students revised their first version of the stop-motion video created the final version by incorporating the suggestions and strategies discussed in the teacher-led discussions and prepared a final product.

Results

This section delves into students' perceptions, opinions, and reflections regarding their learning journey, specifically examining the activities, materials, and methods used. This is crucial for identifying the strengths and weaknesses of the process and guiding future pedagogical decisions. By analysing final questionnaire *responses*, we gained valuable insights into the creation of plurilingual digital didactic materials for preschool children, including student engagement, motivation, challenges faced, and suggestions for improvement.

Evaluation of the Integration of Visuals, Audio, and Text in Digital Didactic Materials for Enhanced Comprehension and Language Acquisition

Overall, the majority of students reported that it was easy to incorporate visuals, audio, and text because the time and context framework (the text and melody of the song) were already given by teachers. However, according to the feedback, the students were successful to different degrees. That is because, in some stop-motion videos, students did not manage to incorporate visuals that would effectively support comprehension of the words in a foreign language.

Namely, their focus was on presenting the context of the song (melody of polka dance) and not on comprehension of vocabulary (i.e. the lyrics of the song). One of the students emphasised that "it was difficult at first because we did not understand the meaning and significance of the song. We were focusing on the wrong elements, i.e. the prepared dance choreography, instead of representing the meaning with pictures of numbers (one, two, three) and so on. But when we received the professor's feedback, we recognised the point and got back to work. We gladly accepted the criticism and improved the video, but this time we did not have as many problems." Another student added: "First of all, we had to listen carefully to the lyrics, which were not written down. That caused us some problems in the first stop-motion video because in the song "Clothes" with French words we misunderstood the meaning of the word. We replaced the word "hat" with a picture of "hair" as if the girl had got a new hairstyle instead of a hat." We had to improve the video

because the English teacher gave us some correction suggestions, but the final product turned out very well. We had almost no technical problems."
Nonetheless, to some students, the task was very clear. One of them pointed out: "We wanted to present certain words to the children in a different language. The song lyrics were underpinned by designed gestures and the words of objects by pictures."

Some of the biggest challenges in creating new digital didactic materials
The students had some problems with various technical elements when creating stop-motion videos. One of the students reported: "First we had to learn how to use the app to be able to work creatively later. In the beginning, we had problems with the unfixed camera, the shots themselves, the timing of the photos with the music, and the movement of the elements on the base. However, when we re-designed the video, we mostly only had to synchronise the photos with the music and the other elements no longer caused any problems. Some students had problems with the shadows and the movement of the background (blanket). One of the students commented: "Our camera was not set up well, so the picture flow was not smooth - we did not take enough pictures to post the actual shot." One group had a similar problem but also found a solution: "One of the problems was also that it was difficult to fix the camera. We helped ourselves by putting our hands on a pile of books. The big change was that we took the photos with a timer in the first phase and photographed them manually in the second phase. This way the transitions were more accurate."
Through the exploration process, the students realised that they needed to plan the process carefully, and one of the students confirmed, "We were successful because we made a good plan before the shoot. We only had concerns about the light as the shoot lasted more than 5 hours and the natural light was changing. Even before the problem could occur, we created artificial light to avoid any inconvenience."

Areas for improvement
The enhancement of visual literacy was crucial for students to effectively integrate visuals, audio, and text to support comprehension. They utilized visual representations to convey the meanings of song backgrounds, symbols, gestures, and cultural elements, aiming to enhance their ability to interpret and communicate visually. This approach enriched their overall comprehension and engagement with the material. For example, they visually presented translations like "Idemo na more"

(in English: "Let us go to the sea") in Croatian, "Merci" (in English: "Thank you") in French, "Per favore" (in English: "Please") in Italian, and "Eins, zwei, drei" (in English: "One, two, three") in German. They also adapted an image to accurately depict pizza Margherita and used visual aids, such as maps and flags, to explain abstract concepts like "Slovenia." This method facilitated a deeper understanding and effective communication of cultural and linguistic nuances through visual literacy.

Concerning the technical improvements, two challenges were posed. The first example referred to too many elements which hindered the understanding of the intended word. Therefore, "We had to enlarge the picture of each word separately – a hat, a dress, and a scarf. In the second example, students had to change a very colourful (distracting) background as it was difficult to recognize the pictures which represented the intended vocabulary.

Student Perspectives on the Application of Stop-Motion Videos Across Different Curriculum Areas

Students mentioned the following areas: language (e.g. creating a story without sound – for storytelling), social sciences (e.g. developing plurilingualism), maths (geometric solids and shapes (e.g. drawing a house, numbers, and rhythm, counting fruit, teddy bears), science (human/animal/plant development, e.g. butterfly, bean, tulips and other flowers), movement, art (e.g. creating sculptures and their movements), music (teaching piano playing).

Discussion

The results of this study provide critical insights into the effectiveness of the TiDE model in promoting plurilingualism and improving the digital competences of future preschool teachers. Through the qualitative evaluation of student-created stop-motion videos, we can assess both the key challenges in creating plurilingual digital didactic materials for preschool children and the benefits of the TiDE model for university preschool teacher education in terms of improving instructional practises and outcomes.

The process of creating stop motion videos initially faced technical challenges such as synchronizing images and sound, and ensuring smooth transitions, alongside conceptual difficulties in accurately representing song lyrics through visuals. These obstacles were effectively overcome through insightful feedback from teachers and peers, providing diverse perspectives, constructive criticism, validation, share

learning experiences, and opportunities for skill development and continuous improvement. This collaborative approach not only facilitated active learning and peer interaction but also contributed to significant enhancements in the final versions of the stop-motion videos. Researchers consistently emphasize that promoting discussion is a key advantage of student-generated stop-motion animations in collaborative settings (Loughran et al., 2012; Hoban and Nielsen, 2014; Jablonski et al., 2015; Mills et al., 2018), underscoring its role in enhancing both the educational process and creative outcomes.

Secondly, the students' evaluation of the process confirmed that the TiDE model offers several benefits for university training of preschool teachers, especially in improving teaching methods and outcomes. Our findings are consistent with those of Hurtado-Mazeyra et al. (2021), who also observed significant benefits from the integration of stop-motion videos in teacher training. Both studies suggest that such digital tools can enhance creative and digital skills, making it a valuable component of modern teacher education.

One major benefit creating stop motion videos is the integration of visual literacy and the development of new digital didactic materials that help students understand the importance of accurately representing linguistic and cultural elements in educational content. The selection and use of images significantly improve their communicative skills and enhance their creativity as they have to visualise, understand, and represent linguistic words, sentences, and abstract concepts.

The activities involved stimulating learners' interest, imagination, and creativity by preparing the background, characters, and storyboard, which is in line with research by Jira et al. (2022), Kahraman (2015), and Farrokhnia et al. (2020). The importance of visual literacy in education is widely recognised, with an increasing focus on developing learners' ability to interpret and communicate with images. This shift emphasises the need to equip future educators with the ability to use visual media effectively (Donaghy & Xerri, 2017), which is consistent with the aims of the TiDE model. By incorporating stop-motion videos or similar tools into their training, preschool teachers can better engage preschool children and enrich their learning experiences.

Another strength of the TiDE model is the applicability of stop-motion videos across various curriculum areas, including English, maths, science, social sciences, health sciences, arts, technology, and media literacy, as recognised by students and highlighted by the National Film Board of Canada (2018) and various studies (Deaton et al., 2013; Shepherd, et al., 2013; Hoban & Nielsen, 2014). This versatility

suggests that stop-motion videos can be a powerful tool to promote creativity and engagement in a variety of educational contexts and make learning more interactive and culturally inclusive. By creating plurilingual digital didactic materials, students have gained first-hand experience of the importance of promoting an inclusive learning environment and linguistic diversity in preschool children. For example, the inclusion of words and phrases in multiple languages helped students to appreciate, understand, and represent linguistic and cultural diversity.

In addition, according to the students' feedback, the process of creating digital didactic materials has significantly improved their technological knowledge and creative skills and fostered a practical understanding of how digital tools can support teaching. This aligns with the research conducted by Deaton et al. (2013). Although a stop-motion video was used in the learning process, other tools such as MS PowerPoint, video, and Animaker can also be chosen, each offering unique benefits and promoting different aspects of creativity and digital literacy. Each of these tools has a different focus and encourages creativity and the development of digital skills to different degrees and in different ways. If students are familiar with multiple options, they can choose the one that appeals to them the most, ensuring accessibility. By allowing students to choose tools, topics, and content they are passionate about, the learning process ensures a high level of engagement and enthusiasm. Recognizing the importance of active intellectual engagement, skilled teachers design activities that challenge students to be cognitively active and provide them with various options to select from. These opportunities help students develop their own understanding. This approach fosters a more personalized and motivating learning experience, ultimately enhancing the effectiveness of the educational process (Danielson, 2007). Supporting this method, a meta-analysis of 41 studies found a strong link between giving students choices and their intrinsic motivation, overall performance, and willingness to accept challenging tasks (Patall et al., 2008). Moreover, this student-centered approach promotes creativity and personal engagement in learning, advocating for its integration into teacher training. Emphasizing active engagement over passive listening, it underscores the importance of interactive, hands-on strategies to keep students academically invested. Teachers who foster critical thinking and problem-solving skills create environments that support excellence, connecting classroom learning with practical real-world applications for students (Rea, 2015). These findings are supported by

research in science education, highlighting that methods where students collaboratively create animations promote learning through their emphasis on being student-centered, active, and cooperative (Orraryd, 2021).

The results of the study indicate the significant value of feedback in refining and enhancing media for language learning. This feedback enhances the quality of didactic materials and guides future teachers in effectively creating and integrating digital resources into their teaching practice, consistent with Dechakoopt and Yindeesook's (2018) emphasis on instructors enhancing their skills in developing and implementing innovative learning strategies in the classroom.

Conclusion

For future teachers, the use of digital didactic tools and materials is becoming increasingly important to meet diverse learning and teaching needs, especially when faced with challenges such as high student numbers and multilingualism. The TiDE model demonstrates substantial potential in fostering plurilingual awareness and technological proficiency among future preschool teachers. The findings of this study suggest that the model is effective in helping students create appropriate, accurate, and engaging didactic digital materials. Additionally, the feedback process involving teachers and peers is crucial in the development of these digital didactic materials, as it boosts students' confidence and motivation and leads to continuous improvement of their teaching methods. Furthermore, the model promotes essential skills such as collaboration, communication, and critical thinking as well as engages students to critically select and create digital didactic materials that are adapted to the interests and needs of the children.

Although the digital didactic materials have been designed to be inclusive and accessible with minimal support, there is still room for improvement as suggested through the obtained feedback that emphasised the importance of ensuring that the visual and audio elements are clear and support understanding. To achieve this, multiple display options can be incorporated such as alternative text for images, subtitles for audio content, and transcripts for videos. In addition, different opportunities for action and expression can be utilized such as allowing users to interact with the materials through different methods, such as touch, speech, or keyboard navigation. Finally, the motivation and engagement of a greater number of learners can be maintained if we offer multiple ways of engagement, such as interactive elements, personalised content, and adjustable difficulty levels. Future

preschool teachers should also consider using such materials in digital corners in the kindergarten that can be used again and again by the children themselves.

Despite the strengths, the study has its limitations, including the small and homogeneous group of participants, which could affect the generalisability of the results. A larger and more diverse sample would improve the understanding of the effectiveness of the TiDE model in different contexts. Furthermore, replicating the study in different courses by various educators would provide insight into its broader applicability. Additionally, the study did not examine the long-term effects of the TiDE model on future preschool teachers' practise and student learning outcomes, which prevents insights into its sustained effectiveness over time.

Overall, the design and implementation of stop-motion video served as an engaging and transformative learning tool, offering both learners and educators opportunities for enjoyment, stimulation, and skill development. This comprehensive approach not only fostered active learning and collaboration but also promoted the development of linguistic, digital, and pedagogical skills.

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